Title: FROM SOURCE TO SINK: LINKING INORGANIC AND BIOAVAILABLE ORGANIC NUTRIENTS TO MICROBIAL DYNAMICS IN FLORIDA BAY.

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Project Summary: With the impending restoration of surface flow through the Everglades, the forms, relative amounts and delivery of dissolved nutrients to Florida Bay from component sources (e.g., C-111, Taylor and Shark Sloughs), particularly dissolved inorganic and organic nitrogen (DIN, DON), are expected to change. As stated in a recent synthesis of Florida Bay research and needs, "Measurements of the composition and bioavailability of Everglades DON to Florida Bay's microbial communities (pelagic, epiphytic, and benthic) are essential in order to assess the functional relationship of Florida Bay and is watershed" (Florida Bay and Adjacent Marine Systems Science Program 2003).

During the past year we have begun a series of measurements designed to examine the nature and distribution of these inorganic and organic nutrient sources and how they shape the microbial community in Florida Bay. Here we aim to further develop these investigations by examining: 1) the concentrations of dissolved organic and inorganic nutrients (carbon, nitorgen, and phosphorus) and the temporal and spatial variability in their component pools within Florida Bay and principal Everglades sources; 2) the short-term (time scale of hours or less) uptake rates of organic and inorganic nitrogen and inorganic phosphorus by various fractions of the microbial community; 3) the relationship between nutrient composition and uptake rates and community composition (as cell counts, bacterial abundance, and HPLC pigments); 4) the response of biomass and physiological indicators in 48 hour bioassay experiements enriched with varying fractions and proportions of organic and inorganic nutrients extracted from Everglades source material; and 5) the stable isotopic composition of dissolved organic and inorganic nutrient sources (carbon [C] and

nitrogen [N] and partiulate biological matter [e.g., algae, seagrass, mangroves, and sedimentary organic matter]) in Florida Bay and the Everglades as well as the change in isotopic composition with time following nutrient enrichments in bioassays. These data will provide insight on the source, cycling and fate of both organic and inorganic nutrient pools, the extent to which dissolved organic nutrients are bioavailable, and the biological responses by the microbial community within Florida Bay. These data will aslo be directly applicable to the developing models that rely on nutrient uptake parameters and estimates of nutrient sources and fluxes in the water column. These results may also provide some guidance as to the importance of nutrient reduction strategies (i.e., which nutrients to target and from which source) and the methodologies for assessing changing inputs of dissolved nutrient sources and their downstream fates in Florida Bay.

Relevance to Restoration and/or Resource Management:

A number of potential nutrient sources (e.g., internal, groundwater, external, sewage, and atmospheric) could support the phytoplankton blooms that occur in the central region of Florida Bay. The proposed multidisciplinary approach of this study will provide data that allows us to directly address the relative importance of most of these different nutrient sources to these blooms, as well as to nutrient dynamics within other regions of Florida Bay. Additionally, the proposed research will address, through basic measurements and linkages with other research, fundamental problems of concern to water quality managers. These include the significance of organic nutrients in coastal systems relative to inorganic nutrients and the effects of different nutrient forms on phytoplankton community composition, both of which have been implicated in a global increase in the occurrence and frequency of harmful algal bloom (HAB) events.

Ultimately, the goal of this research is to provide predictive capability in evaluating downstream effects of Everglades restoration activities on South Florida ecosystems.

Geographic Area: Florida Bay, C-111, Taylor and Shark Sloughs.